

**CLAIMS**

5 A process for dry recycling of (U,Pu)O<sub>2</sub> mixed-oxide nuclear fuel scrap arising from the manufacture of fuel or from the scrapping of fuel as result of shortage or discontinuation of use, comprising:

- a process for manufacturing (U,PU)O<sub>2</sub> mixed oxide fuel pellets including:
  - \* a dispensing and a first blending (1) of waste in powder form and, if required, of PuO<sub>2</sub> and/or UO<sub>2</sub> powders,
  - \* micronization (2) and forced sieving (3) of this first blend,
  - 10 \* another dispensing and a second blending (4) of the first sieved blend, of UO<sub>2</sub> powders and, if required, of scrap in powder form,
  - shaping* → \* pelletizing (6) of the second blend, and
  - \* sintering (7) of the resulting pellets, and
- a process for pretreating scraps including:
  - 15 \* pelletizing (20) and sintering (21) of powder scraps in order to form scrap pellets, and
  - \* micronization (23) of the scrap pellets in order to form scrap powder designed to be incorporated as scrap in powder form into the first (1) and/or second (4) blend.

20 2. The process as claimed in claim 1, which, in addition, includes crushing (22) of the scrap pellets before their micronization.

25 3. The process as claimed in either of claims 1 and 2, wherein scrapped unsintered powders and/or powders arising from grinding (8) of fuel pellets are taken as powder scrap for the aforementioned pelletizing (20) and sintering (21) of the pretreatment.

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4. The process as claimed in any one of claims 1 to 3, wherein unirradiated (U,Pu)O<sub>2</sub> mixed-oxide nuclear fuel pellets, possibly produced by different manufacturing processes and scrapped, undergo the same pretreatment process as the aforementioned scrap pellets for the purpose of recycling them.

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5. The process as claimed in any one of claims 1 to 3, wherein up to 40% of scrap, with respect to the net production, is incorporated into the

aforementioned process for manufacturing fuel pellets.

6. The process as claimed in any one of claims 1 to 3, wherein up to 100% of scrap is incorporated into said first blend (1).
7. The process as claimed in any one of claims 1 to 3, wherein a proportion of 99.5%, expressed as mass of  $\text{PuO}_2$ , of the scraps from the aforementioned process for manufacturing fuel pellets is dry-recycled.
8. The process as claimed in any one of claims 1 to 7, wherein a ball milling process is used for the micronization (2, 23) of the first blend and/or of the scrap pellets.
9. The process as claimed in any one of claims 1 to 8, wherein a lubricant is added before pelletizing (6 and 20), preferably zinc stearate.
10. The process as claimed in any one of claims 1 to 9, wherein the fuel pellets containing scraps and/or the scrap pellets are sintered (7, 21) in an argon and hydrogen atmosphere, preferably at a temperature of between 1670 and 1760°C.
11. The process as claimed in any one of claims 1 to 10, wherein, during sintering (7, 21), the partial pressure of oxygen  $p_{\text{O}_2}$  is adjusted, preferably by humidification, in order to improve the interdiffusion of the  $\text{PuO}_2$  and  $\text{UO}_2$  oxides.
12. The process as claimed in any one of claims 1 to 11, wherein scraps and/or  $\text{UO}_2$  and  $\text{PuO}_2$  oxide powders are recovered during the process or transfer operations by means of cleanable filters, so as to recycle them into scrap pellets at the pelletizing (20) and sintering (21) step.